Appendix E.4: Flood

Hazard Ranking

The flood hazard ranking was based on the Average Annual Losses as determined from NFIP records. The Average Annual Losses as compiled by NFIP represent the total NFIP claims payments for each parish divided by the number of years the parish has participated in the NFIP during 1978 through 2003. The total of the Average Annual Losses for all the parishes is $52,777,787. The Average Annual Loss figures were used for the following reasons:

- NFIP loss data provided the best relative measure for all the parishes in Louisiana.
- Other candidate sources of information did not provide uniform coverage throughout the State (e.g., digital floodplain mapping that would lend itself to this type of analysis is only available for 37 out of the 64 parishes) or were not considered as reliable in the opinion of the SHMPC;

The high / medium / low rankings for each parish were developed by:

- Obtaining the NFIP Average Annual Loss data;
- Sorting the list by parish from highest to lowest losses;
- Assigning the high rank to parishes with losses greater than or equal to $1 million;
- Assigning the medium rank to parishes where losses are less than $1 million but greater than or equal to $100 thousand; and
- Assigning the low rank to parishes with losses less than $100 thousand.

The resulting ranked parishes are shown in in Table E-10. Map E-1 presents the ranking of all the parishes with high, medium and low risk to floods.

Table E-10. Parishes Ranked by Average Annual Losses

Ranking	Parish	Avg Annual Losses
1	Jefferson	$16,636,089
2	Orleans	$9,917,720
3	St. Tammany	$4,917,265
4	Terrebonne	$2,760,739
5	East Baton Rouge	$2,574,404
6	St. Charles	$2,503,167
7	Livingston	$1,770,670
8	Ouachita	$1,337,105
9	St. Bernard	$1,159,775
10	Lafourche	$1,057,647
11	Calcasieu	$794,837
12	Lafayette	$643,508
13	Ascension	$542,240

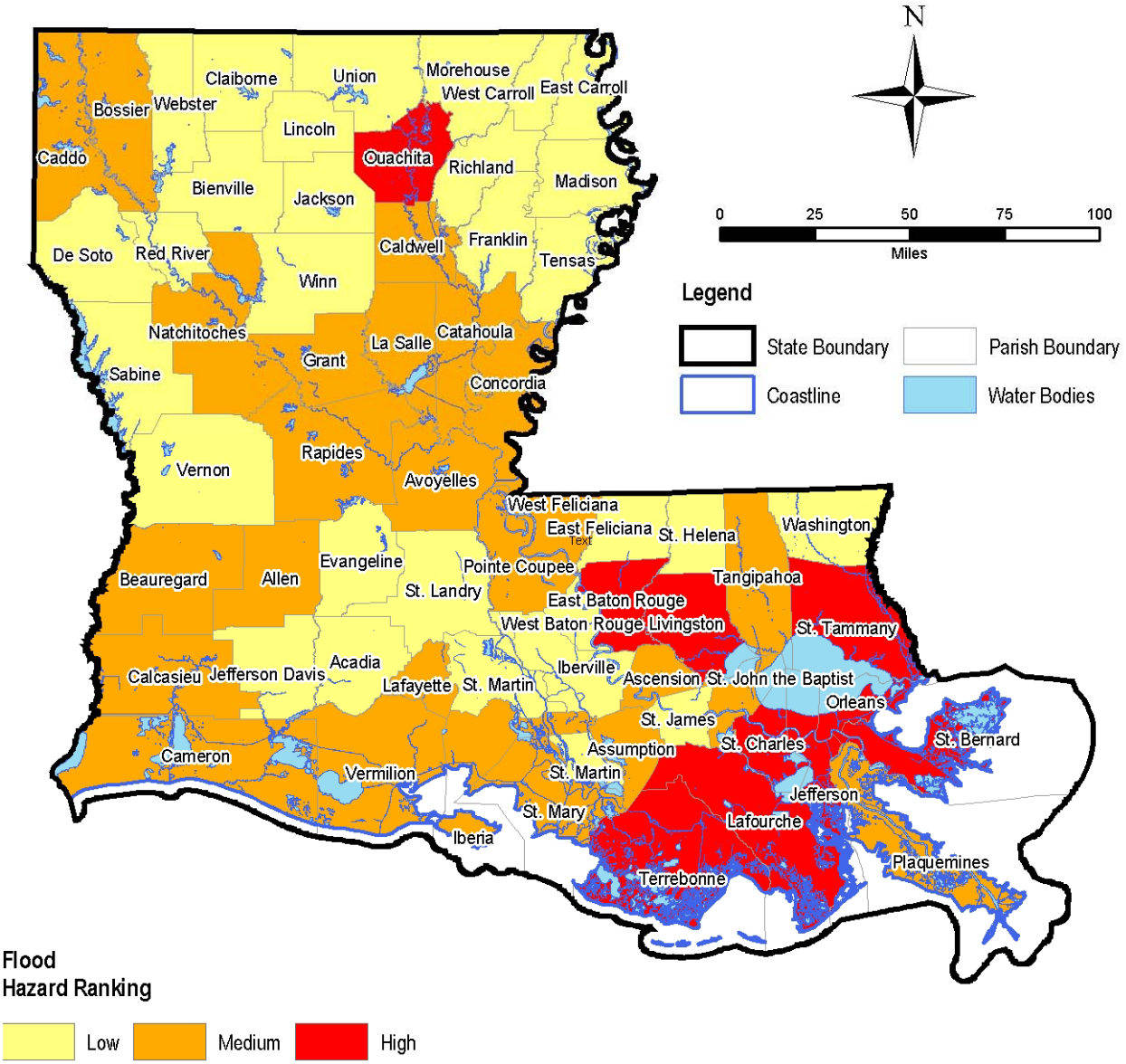
Table E-10 (continued)

Ranking	Parish	Avg Annual Losses
14	Pointe Coupee	$503,214
15	Caddo	$499,227
16	Catahoula	$447,565
17	Rapides	$441,185
18	Plaquemines	$399,126
19	Vermilion	$375,820
20	Bossier	$321,340
21	Concordia	$309,825
22	St. Mary	$308,353
23	Avoyelles	$180,564
24	Iberia	$166,914
25	La Salle	$165,627
26	Tangipahoa	$163,350
27	Beauregard	$159,673
28	Allen	$118,924
29	St. John the Baptist	$113,760
30	Cameron	$112,390
31	Caldwell	$109,676
32	Assumption	$105,916
33	Grant	$98,200
34	Natchitoches	$97,407
35	Winn	$84,709
36	West Feliciana	$84,455
37	St. Martin	$80,009
38	Washington	$78,752
39	Union	$63,551
40	St. Landry	$50,792
41	Iberville	$48,268
42	Webster	$47,129
43	Acadia	$46,133
44	Tensas	$44,763
45	Franklin	$43,259
46	Richland	$42,563
47	Morehouse	$40,361
48	Madison	$32,647
49	Jefferson Davis	$29,745
50	Vernon	$27,669
51	St. James	$18,857
52	Jackson	$15,530
53	Desoto	$14,495
54	East Feliciana	$14,015
55	East Carroll	$12,067
56	Evangeline	$11,070
57	West Baton Rouge	$10,840

Table E-10 (continued)

Ranking	Parish	Avg Annual Losses
58	Claiborne	$7,575
59	Bienville	$5,255
60	West Carroll	$3,944
61	Red River	$2,080
62	St. Helena	$1,858
63	Lincoln	$1,823
64	Sabine	$351

Map E-1: Hazards Ranking Based on Average Annual Losses



Methodology

Historical data from the NFIP flood claims database, based on claims paid to parishes during January 1, 1978 through December 31, 2003, was used to extrapolate future losses. It is assumed that historic flood losses are indicative of what future losses might be for each parish. The NFIP claims payments were used to calculate annualized flood loss by dividing the total payments for each parish (unincorporated areas) and municipalities by the number of years that they have participated in the NFIP during 1978 through 2003. Then the average annual losses for each parish (including municipalities within each parish) were totaled. The flood hazard ranking was developed by sorting the list of average annual losses by parish from highest to lowest.

Claims payments and repetitive loss data are described below to provide an understanding of vulnerability and losses, which were used to establish hazard mitigation priorities. Specifically, information regarding the number of NFIP claims, average annual NFIP claims and number of repetitive loss properties is provided below.NFIP claims payments were used to calculate average annual flood loss by dividing the total payments for each parish (i.e., unincorporated) and municipalities by the number of years that they have participated in the NFIP during 1978 through 2003. Then the average annual losses for the parish and municipalities (within each parish) were totaled for each parish.

Data Limitation

This methodology uses a large number of flood insurance claims from a reliable source, the NFIP. The time period over which the data extends is fairly lengthy (25 years), so the effect of any year-to-year fluctuations in claims is minimal. Because of these factors, the average annual figures can be considered reliable with the following limitation. The calculation is based on a database of insurance claims, not flood losses to the community. In many communities, uninsured homes, businesses, and infrastructure are damaged in floods and the damage is not reflected in the NFIP data because no claims are made. Therefore, actual flood losses for some parishes may be higher than indicated by the NFIP claim data.

Additional Methodology

Another method used to rank the flood hazard in Louisiana is described below. Instead of using just one indicator, the average annual NFIP claim, the flood hazard ranking can be based on two other NFIP indicators :1) number of NFIP claims (losses), and 2) the number of repetitive losses. Together these indicators provide a broader understanding of flood impacts, versus looking at one of these indicators alone. The parishes were ranked 1 (highest impact) to 64 (lowest impact) for each of the indicators. Indicator rankings were then summed for each parish, resulting in an overall ranking to flood impacts.

Tables E-11 and E-12 list parishes from highest to lowest number of claims and repetitive losses, respectively.

Table E-11. Parishes with Highest Number of NFIP Claims (Number of Losses)

Rank	Parish	Number of Claims (Losses)
1	Jefferson	55,434
2	Orleans	47,331
3	St. Tammany	11,017
4	East Baton Rouge	6,809
5	Terrebonne	6,515
6	St. Bernard	6,318
7	Livingston	4,482
8	Ouachita	3,726
9	St. Charles	3,425

Table E-11 (continued)

Rank	Parish	Number of Claims (Losses)
10	Lafourche	3,138
11	Calcasieu	2,639
12	Catahoula	2,477
13	Pointe Coupee	2,453
14	Lafayette	2,278
15	Ascension	1,914
16	Rapides	1,826
17	Avoyelles	1,554
18	St. Mary	1,500
19	Concordia	1,432
20	Caddo	1,360
21	Plaquemines	942
22	Vermilion	852
23	Assumption	800
24	La Salle	762
25	Iberia	731
26	St. Martin	637
27	Tangipahoa	625
28	Cameron	582
29	West Feliciana	571
30	St. John the Baptist	538
31	Bossier	500
32	Caldwell	454
33	Beauregard	430
34	Grant	412
35	Iberville	365
36	Natchitoches	340
37	Allen	331
38	Acadia	317
39	Washington	290
40	St. Landry	269
41	Tensas	225
42	Union	185
43	Franklin	180
44	Madison	175
45	Richland	166
46	Winn	118
47	Webster	112
48	Jefferson Davis	104
49	East Carroll	88
50	West Baton Rouge	81
51	St. James	70

Table E-11 (continued)

Rank	Parish	Number of Claims (Losses)
52	Morehouse	69
53	Jackson	64
54	Vernon	46
55	East Feliciana	42
56	Evangeline	40
57	Desoto	22
58	Bienville	17
59	Claiborne	17
60	St. Helena	11
61	West Carroll	9
62	Lincoln	7
63	Red River	6
64	Sabine	3

Table E-12. Repetitive Losses in Louisiana

Rank	Parish	Repetitive Losses (#)
1	Orleans	5,612
2	Jefferson	5,013
3	St. Bernard	704
4	St. Tammany	569
5	East Baton Rouge	564
6	Livingston	276
7	Lafayette	143
8	Calcasieu	138
9	Pointe Coupee	137
10	Rapides	116
11	Terrebonne	100
12	Lafourche	85
13	Concordia	80
14	Ouachita	75
15	Catahoula	72
16	Ascension	67
17	St. Charles	65
18	Caddo	43
19	Washington	34
20	Avoyelles	30
20	St. Mary	30
20	Vermilion	30
21	Cameron	27
22	La Salle	26
23	Bossier	22

Table E-12 (continued)

Rank	Parish	Repetitive Losses (#)
24	Assumption	21
25	Iberia	20
26	Plaquemines	19
26	St. John the Baptist	19
27	Beauregard	17
28	Tangipahoa	16
29	Webster	12
30	Richland	10
30	West Feliciana	10
31	Allen	9
31	Natchitoches	9
32	Acadia	8
32	East Feliciana	8
33	Franklin	6
33	Morehouse	6
33	St. Landry	6
33	Union	6
34	Grant	5
34	Jackson	5
35	Caldwell	4
35	Iberville	4
35	St. Martin	4
35	Tensas	4
36	Bienville	0
36	Claiborne	0
36	Desoto	0
36	East Carroll	0
36	Evangeline	0
36	Jefferson Davis	0
36	Lincoln	0
36	Madison	0
36	Red River	0
36	Sabine	0
36	St. Helena	0
36	St. James	0
36	Vernon	0
36	West Baton Rouge	0
36	West Carroll	0
36	Winn	0

Methodology - Population

The analysis for population exposure used U.S. Census 2000 data and Q3 flood data (for 37 parishes). Exposure was based on the location of the population and structures within the 100- and 500-year floodplains and was determined for the 37 parishes for which Q3 flood data was available. The Q3 flood data, which includes a spatially referenced map of the 100- and 500-year floodplain boundaries, are derived from FEMA FIRMS

The HAZUS Flood Wizard was used to determine exposure for population. Flood Wizard was designed to estimate in a "fast", approximate way exposure and losses associated to *riverine* related flooding. Flood Wizard works as follows: it estimates the "depth" of any point inside the flooded area considering the ground elevation at the point and the ground elevation at the border of the flood polygon, which is the area that is flooded by a 100- and 500-year flood. In this way, the water "depth" at any point is estimated. A damage function is then applied considering factors like typical structure elevation and occupancy type. Demographic data is aggregated at block level. In order to estimate the proportion of the block that is "inundated", an area-weighted approach is used. Flood Wizard estimates the proportion of the block "inside" the flooded area.

Results

Population exposure was reported for the 37 parishes with Q3 data. Table E-13 presents the calculated number of people in each parish exposed to the 100- and 500-year flood event.

Table E-13. Population Exposure to 100- and 500-year Flood Event

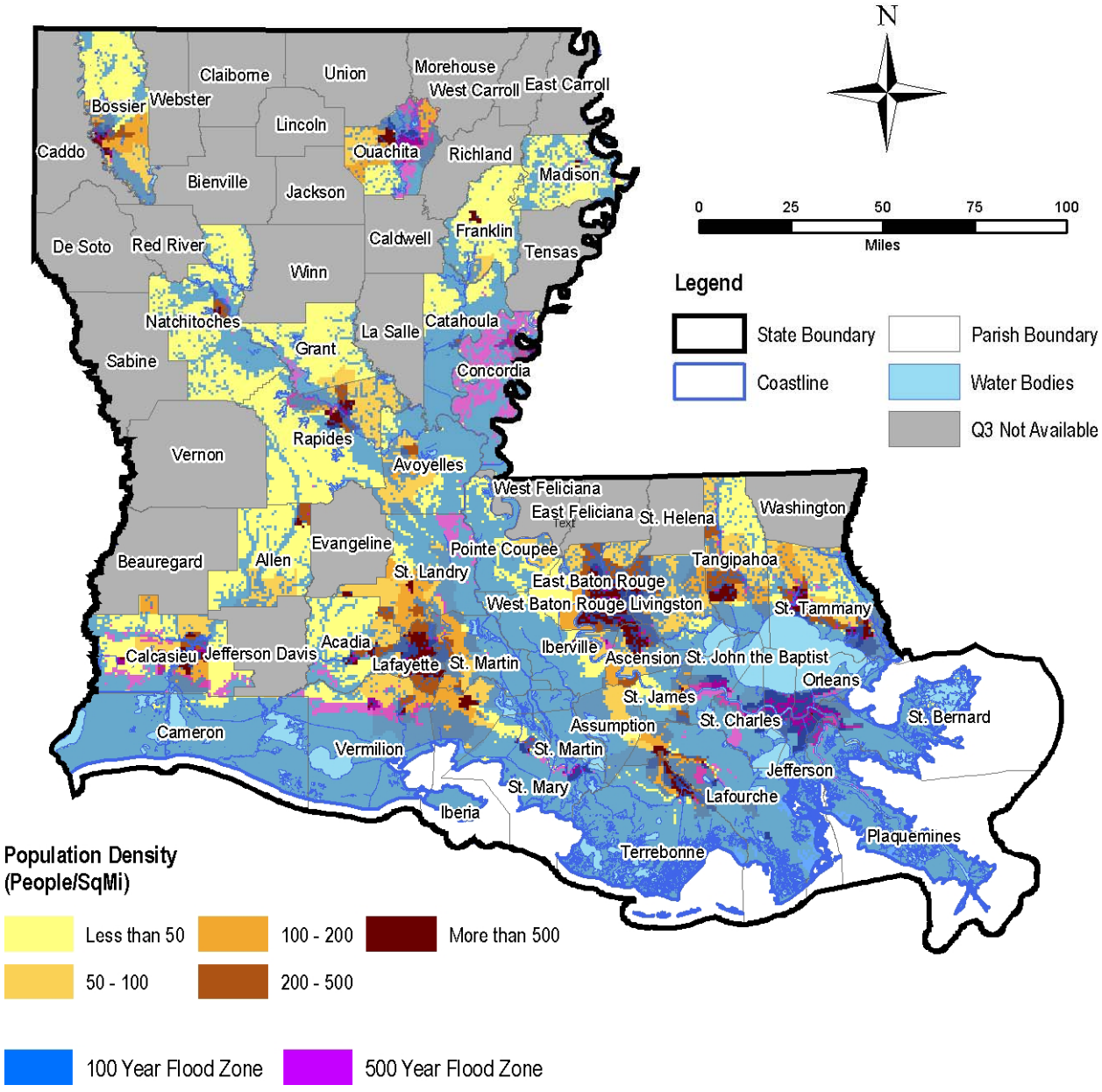
Population Exposure		
Parish	100-year	500-year
Acadia	17,940	24,700
Allen	7,100	7,100
Ascension	27,380	30,610
Assumption	9,210	9,230
Avoyelles	8,990	10,150
Bossier	22,450	28,780
Calcasieu	38,830	61,380
Cameron	8,940	8,940
Catahoula	6,070	6,280
Concordia	3,000	15,980
East Baton Rouge	95,450	115,940
Franklin	3,680	4,060
Grant	3,210	4,940
Iberia	10,480	10,570
Iberville	5,990	8,200
Jefferson	303,440	454,870
Lafayette	41,700	52,040
Lafourche	47,170	52,540
Livingston	50,380	55,270
Madison	4,140	4,820
Nachitoches	8,390	8,690
Orleans	337,520	484,520
Ouachita	29,480	102,930

Table E-13 (continued)

Population Exposure		
Parish	100-year	500-year
Plaquemines	16,500	26,760
Pointe Coupe	6,750	6,820
Rapides	27,160	32,750
Saint Bernard	27,460	67,230
Saint Charles	25,460	48,060
Saint James	1,880	1,880
Saint John the Baptist	8,820	43,040
Saint Landry	17,120	19,690
Saint Martin	12,430	12,900
Saint Mary	20,340	46,050
Saint Tammany	69,890	83,660
Tangipahoa	29,530	32,250
Terrebonne	44,300	47,020
Vermillion	19,460	28,710

Population densities and 100-year and 500-year floodplain boundaries were mapped to show where the highest populations are located within the floodplain. Map E-2 illustrates the flood vulnerability and population density.

Map E-2: Flood Vulnerability and Population Density for 37 Louisiana Parishes



Data Limitations

Flood loss estimates were unable to be quantified using the flood macro due to limitations with the Q3 flood plain data; specifically, storm surge induced flood (i.e., VE) could not be differentiated from riverine-related flood zones in coastal plains) . It was difficult to quantify flood elevations, which are needed to determine flood loss, in all of the 37 parishes.

Flood hazard exposure was assessed for the population, general building stock (residential, industrial, commercial, governmental, educational, agricultural and religious) and contents, critical facilities, and transportation and utility systems in Louisiana. The general building stock and critical facilities are referred to as the HAZUS-MH inventory. Flood exposure was determined using Q3 data (i.e., floodplain data, refer to Appendix A.2 for definitions)) that was available for 37 parishes.

Due to limitations of the Q3 flood data, which do not have flood elevations, and the significant number of flood loss claims in Louisiana, the loss estimates were based on historical data.

Methodology - General Building Stock

The HAZUS-MH general building stock data provides the building valuation for each specific occupancy classification (e.g., residential, commercial) developed from the U.S. Census 2000 and Dun & Bradstreet (D&B). The general building stock data set includes the residential, commercial, industrial, governmental, educational, agricultural and religious buildings for each parish. This data was developed at the census block level and then aggregated at census tract level. This data set is from the 2000 version of TIGER/Line files and first quarter of 2002 data from D&B andwas developed by applying RS Means replacement values for typical building floor areas and construction for each specific occupancy, which is a nationally accepted reference on building construction costs and is published annually.

The analysis for the general building stock exposure used HAZUS-MH general building stock data and Q3 flood data. Building value exposure was based on identifying the value of the buildings within the 100- and 500-year floodplains. The HAZUS Flood Wizard was used to determine exposure for the general building stock. (Refer to Poplution Methodology for a discussion of Flood Wizard.) The building stock is aggregated at block level. In order to estimate the proportion of the block that is "inundated," an area-weighted approach is used. Flood Wizard estimates the proportion of the block "inside" the flooded area.

Results

Building exposure for the 100- and 500-year flood event was reported for each of the 37 parishes that had available Q3 data, as shown in Tables E-14 and E-15 respectively.

Table E-14. 100-Year Flood Exposure for General Building Stock for 37 Parishes with Q3 Data

Parish	100-Year Flood Exposure ($1,000)							
	Residential	Commercial	Industrial	Governmental	Educational	Agricultural	Religious	Total
Acadia	1,116,925	76,094	16,023	3,741	4,086	16,689	6,641	1,240,199
Allen	447,027	43,270	14,858	1,134	1,746	792	5,696	514,522
Ascension	1,660,075	169,450	33,264	1,030	5,850	1,602	7,697	1,878,969
Assumption	555,210	42,235	9,403	1,571	6,064	631	5,349	620,464
Avoyelles	609,406	33,419	4,783	182	506	2,304	27,744	678,344
Bossier	1,778,714	238,286	37,684	21,522	7,051	3,179	22,168	2,108,603
Calcasieu	2,604,314	751,985	107,218	7,790	13,917	3,236	27,976	3,516,436
Cameron	689,529	102,454	47,494	6,181	11,581	1,553	14,846	873,637
Catahoula	415,441	18,557	10,537	422	336	2,147	5,209	452,649
Concordia	217,767	21,318	1,466	636	1,694	4,851	9,723	257,455
East Baton Rouge	7,079,791	1,447,006	230,069	39,416	41,532	14,586	126,615	8,979,015
Franklin	229,449	29,544	3,601	300	7	3,743	4,873	271,517
Grant	225,186	5,099	2,584	105	1,708	776	2,951	238,409
Iberia	595,337	126,504	72,138	702	7,717	1,244	5,995	809,637
Iberville	356,129	12,483	3,315	8,161	0	1,148	5,543	386,778
Jefferson	22,245,717	4,329,783	646,927	57,279	104,623	19,256	139,814	27,543,398
Lafayette	2,646,107	436,148	151,001	3,882	13,404	4,801	25,666	3,281,008
Lafourche	3,010,595	447,615	103,683	10,017	18,182	8,408	42,548	3,641,047

Table E-14 (continued)

Parish	100-Year Flood Exposure ($1,000)							
	Residential	Commercial	Industrial	Governmental	Educational	Agricultural	Religious	Total
Livingston	3,009,400	338,462	65,692	6,383	15,430	3,421	41,441	3,480,228
Madison	230,336	11,010	364	922	0	558	315	243,504
Nachitoches	539,556	58,591	8,160	1,610	3,926	5,627	17,416	634,885
Orleans	24,103,797	3,767,212	449,971	67,300	117,090	14,230	229,694	28,749,295
Ouachita	1,987,848	314,490	47,259	1,633	6,040	2,411	43,489	2,403,170
Plaquemines	900,567	146,266	69,310	3,049	8,760	1,872	15,928	1,145,752
Pointe Coupe	503,560	27,155	5,895	431	1,092	1,466	3,509	543,108
Rapides	1,672,321	235,246	44,743	4,065	8,989	5,090	19,749	1,990,203
Saint Bernard	1,985,332	179,412	32,070	9,128	3,335	1,137	15,069	2,225,483
Saint Charles	1,914,891	209,600	109,432	5,862	8,894	1,337	22,152	2,272,167
Saint James	123,783	25,732	3,580	0	0	477	0	153,572
Saint John the Baptist	738,366	113,607	36,626	1,672	504	630	3,363	894,767
Saint Landry	1,101,611	164,464	34,409	4,840	8,725	3,420	5,874	1,323,342
Saint Martin	821,932	58,742	10,091	463	8,458	1,027	5,831	906,543
Saint Mary	1,175,670	298,206	122,275	5,640	10,475	1,799	18,315	1,632,381
Saint Tammany	5,706,390	850,412	105,497	16,766	28,415	6,864	56,483	6,770,827
Tangipahoa	1,775,758	174,535	26,525	14,777	14,248	4,009	34,008	2,043,860
Terrebonne	2,621,398	461,086	114,171	17,973	35,688	5,326	42,425	3,298,067
Vermillion	1,275,958	110,603	20,264	2,030	2,533	1,897	5,925	1,419,210
TOTAL	98,671,191	15,876,077	2,802,381	328,615	522,603	153,543	1,068,039	119,422,449

Table E-15. 500-Year Flood Exposure for General Building Stock in 37 Parishes with Q3 Data

Parish	500-Year Flood Exposure ($1,000)							
	Residential	Commercial	Industrial	Governmental	Educational	Agricultural	Religious	Total
Acadia	1,563,590	108,263	18,684	4,503	4,656	17,217	8,799	1,725,711
Allen	447,346	43,281	14,868	1,179	1,769	792	5,705	514,941
Ascension	1,862,889	217,070	35,747	3,463	7,337	2,215	9,096	2,137,817
Assumption	556,575	42,235	9,403	1,571	6,064	631	5,349	621,828
Avoyelles	669,459	35,892	4,783	243	506	2,321	28,338	741,541
Bossier	2,209,718	362,987	51,782	24,761	12,348	3,765	29,946	2,695,307
Calcasieu	4,039,423	984,061	253,360	8,933	20,749	5,814	43,945	5,356,285
Cameron	689,529	102,454	47,494	6,181	11,581	1,553	14,846	873,637

Table E-15 (continued)

Parish	500-Year Flood Exposure ($1,000)							
	Residential	Commercial	Industrial	Governmental	Educational	Agricultural	Religious	Total
Catahoula	431,690	28,669	11,287	423	585	2,263	5,442	480,359
Concordia	990,117	121,040	18,091	5,618	5,338	10,005	24,006	1,174,215
East Baton Rouge	8,616,083	1,930,051	275,442	60,267	52,292	16,396	158,777	11,109,308
Franklin	251,067	35,769	4,554	397	7	3,780	5,137	300,709
Grant	326,205	15,298	7,424	2,285	3,290	1,222	5,629	361,353
Iberia	599,345	126,621	72,138	702	7,717	1,244	5,995	813,763
Iberville	407,748	22,144	23,714	9,931	0	1,258	6,483	471,277
Jefferson	33,778,448	7,468,775	1,310,290	90,829	187,753	40,481	264,321	43,140,897
Lafayette	3,384,521	565,762	181,094	5,848	16,663	5,467	32,944	4,192,299
Lafourche	3,390,747	473,232	107,343	11,259	18,694	9,688	44,181	4,055,144
Livingston	3,301,684	360,330	68,753	7,825	16,150	4,120	43,907	3,802,768
Madison	266,069	13,046	385	994	0	558	371	281,424
Nachitoches	561,682	59,545	8,613	1,610	3,926	5,732	17,742	658,850
Orleans	35,522,374	6,737,809	894,080	162,962	200,925	20,054	377,844	43,916,048
Ouachita	6,804,025	1,267,675	263,334	37,842	40,580	7,698	103,503	8,524,658
Plaquemines	1,549,316	205,101	90,548	5,428	8,760	4,962	23,886	1,888,001
Pointe Coupe	509,447	27,528	5,924	550	1,092	1,478	3,666	549,685
Rapides	1,999,891	298,768	58,805	5,433	11,935	5,601	28,146	2,408,579
Saint Bernard	4,672,355	497,802	114,697	10,178	5,396	3,260	37,844	5,341,532
Saint Charles	3,364,783	322,040	172,429	26,853	16,236	2,910	42,894	3,948,145
Saint James	123,783	25,732	3,580	0	0	477	0	153,572
Saint John the Baptist	2,874,439	348,740	70,854	9,272	18,682	3,160	28,876	3,354,023
Saint Landry	1,256,402	183,055	36,971	5,987	9,513	3,706	7,767	1,503,400
Saint Martin	847,209	61,919	10,435	463	8,972	1,027	6,491	936,516
Saint Mary	2,820,325	536,365	159,105	8,842	19,373	2,671	34,957	3,581,637
Saint Tammany	6,829,058	1,081,963	120,004	22,292	36,667	8,707	66,994	8,165,686
Tangipahoa	1,936,167	189,197	29,619	16,118	14,311	4,611	38,045	2,228,067
Terrebonne	2,859,727	527,261	125,604	18,874	38,323	5,674	48,140	3,623,603
Vermillion	1,850,659	142,630	22,887	2,212	5,023	2,237	7,123	2,032,771
TOTAL	144,163,894	25,570,110	4,704,124	582,128	813,210	214,754	1,617,134	177,665,353

Data Limitations

Flood depth data is needed to calculate more accurate exposure and loss estimates.

Methodology - Critical Facilities

The HAZUS-MH critical facilities data set includes medical care facilities, fire stations, police stations, emergency response centers and schools. The critical facilities data was produced from national databases, as follows:

The medical care facilities database was produced from data provided by the American Hospital Association (AHA).

The fire stations, police stations and emergency response centers databases were produced from geocoded data provided by InfoUSA Inc. that extracted records of fire stations, police stations and emergency response centers based on Standard Industry Classification (SIC) Code for the entire United States.

The schools database was produced from the Public Elementary/Secondary School Universe Survey Data and the Private School Universe Survey Data maintained by the National Center for Education Statistics, US Department of Education.

The analysis for critical facilities exposure used HAZUS-MH critical facilities data and Q3 flood data. Data points for critical facilities were overlaid with Q3 data to determine exposure by providing a count of the number of each type of critical facility that is located in the 100-year and 500-year floodplains per parish.

Results

Critical facilities exposure is presented for each of the 37 parishes with Q3 data in Table E-16 and Maps E-3 through E-7. East Baton Rouge, Jefferson, and Orleans Parishes have the greatest exposure to both 100- and 500-year floods, predominantly to residential structures, but also to critical facilities (i.e., medical care facilities, police stations, and schools).

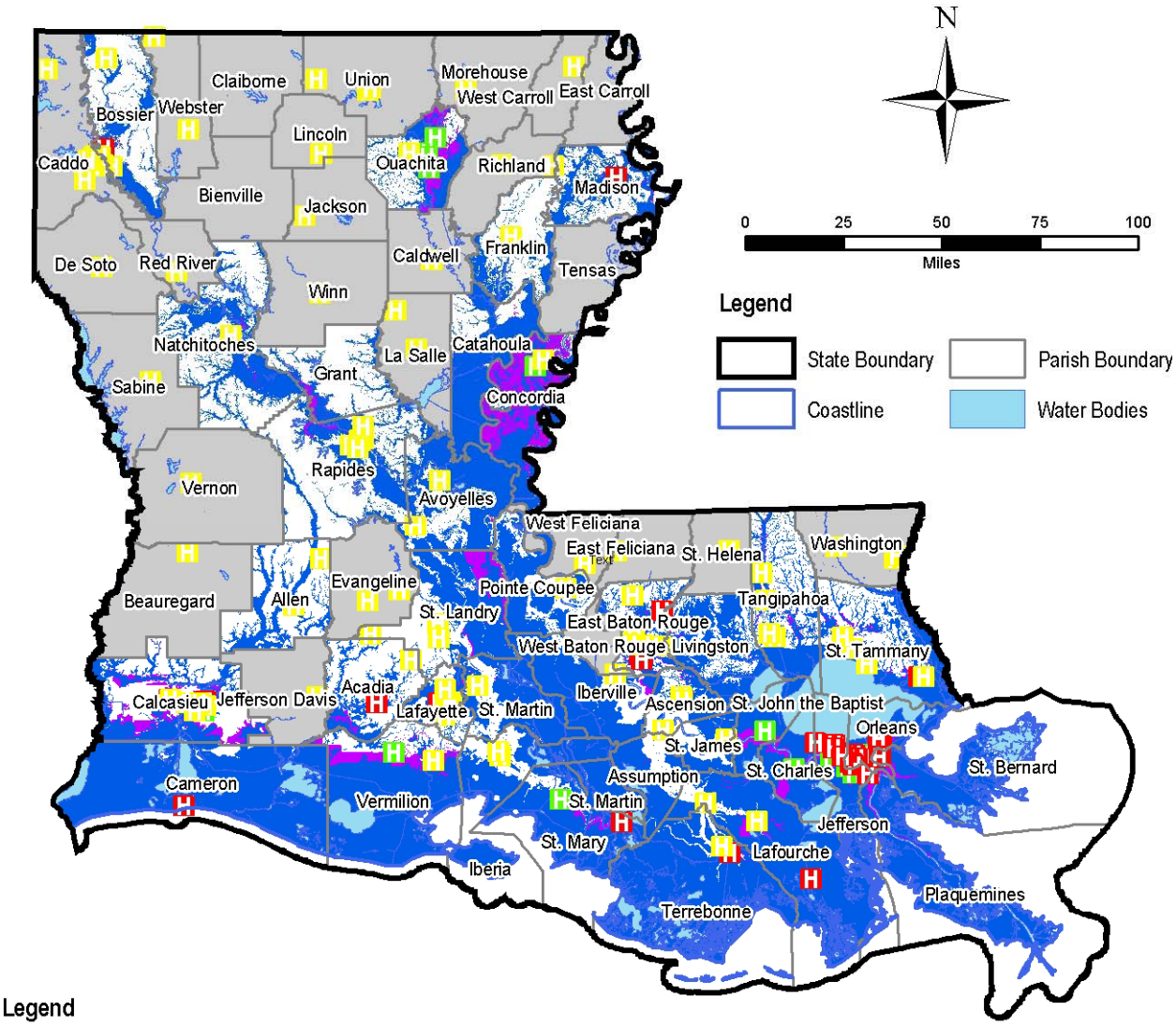
Table E-16. 100-Year and 500-Year Flood Exposure for Critical Facilities in Louisiana Parishes

Parish	Critical Facilities (Number of Facilities)									
	100-Year Flood					500-Year Flood				
	Medical Care Facility	Fire Stations	Police Station	Emergency Response Centers	Schools	Medical Care Facility	Fire Stations	Police Station	Emergency Response Centers	Schools
Acadia	1	3	9	1	7	1	3	10	1	12
Allen	0	1	1	0	1	0	1	1	0	1
Ascension	0	2	1	0	9	0	3	1	0	11
Assumption	0	1	1	0	4	0	1	1	0	4
Avoyelles	0	0	1	0	3	0	0	1	0	3
Bossier	1	0	0	0	1	1	0	0	0	9
Calcasieu	2	1	2	0	9	3	7	5	0	10
Cameron	0	10	6	1	6	1	10	6	1	6
Catahoula	0	0	1	0	3	0	0	1	0	3
Concordia	0	0	0	0	1	1	0	11	0	8
East Baton Rouge	4	1	1	0	27	4	1	1	0	35
Franklin	0	0	0	0	1	0	0	0	0	1
Grant	0	1	2	0	0	0	3	4	1	1
Iberia	0	3	2	0	4	0	3	2	0	4
Iberville	0	0	0	0	0	0	0	0	0	0
Jefferson	6	14	9	0	77	8	24	22	0	142

Table E-16 (continued)

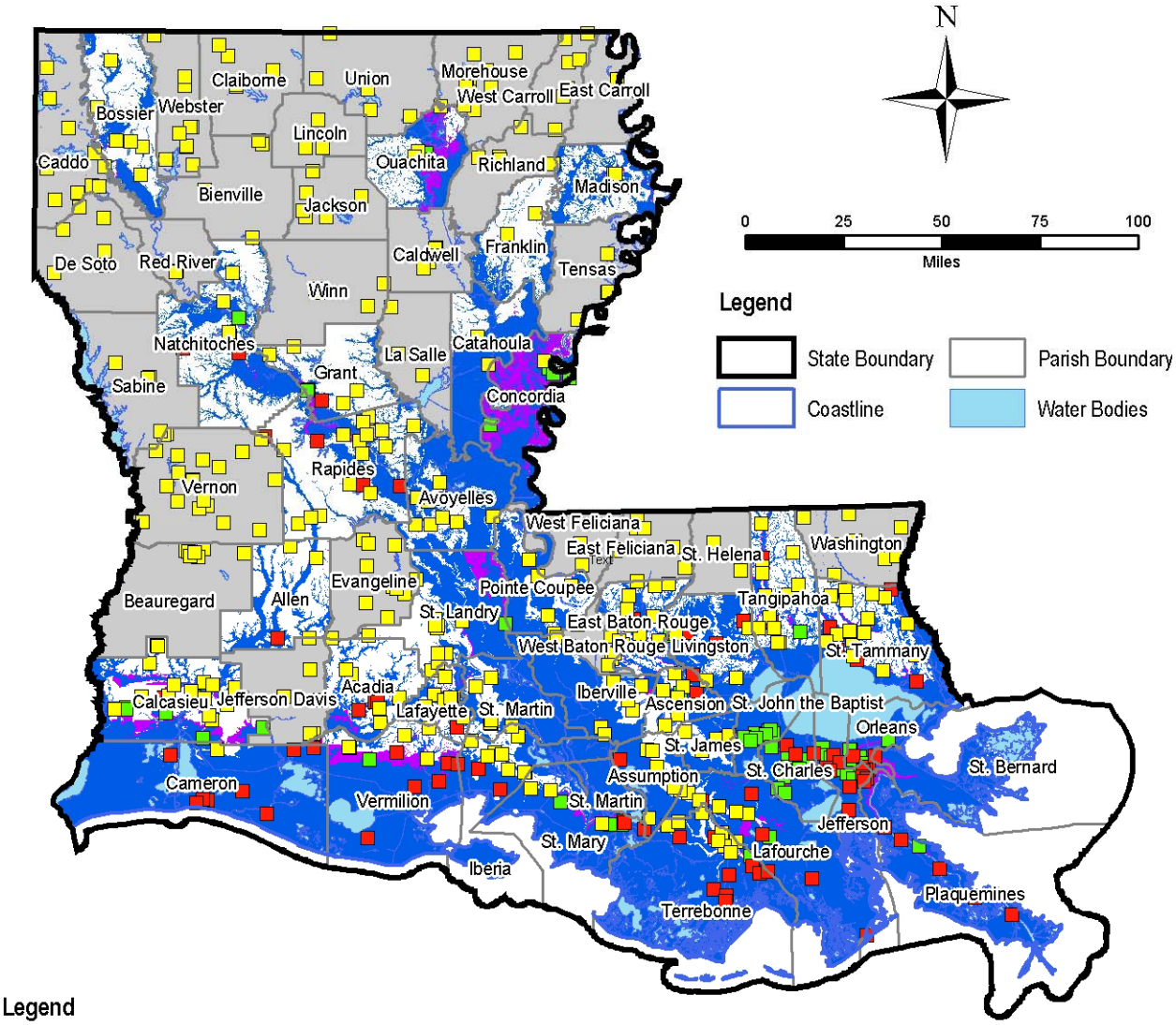
Parish	Critical Facilities (Number of Facilities)									
	100-Year Flood					500-Year Flood				
	Medical Care Facility	Fire Stations	Police Station	Emergency Response Centers	Schools	Medical Care Facility	Fire Stations	Police Station	Emergency Response Centers	Schools
Lafayette	1	1	2	0	8	1	1	2	0	11
Lafourche	0	4	4	0	15	1	5	5	0	19
Livingston	0	4	2	0	11	0	5	3	0	11
Madison	1	0	0	0	2	1	0	0	0	2
Nachitoches	0	2	3	0	3	0	3	3	0	4
Orleans	13	1	24	1	136	16	5	36	1	197
Ouachita	0	0	0	0	5	6	2	11	1	52
Plaquemines	0	5	2	0	10	0	7	6	0	13
Pointe Coupe	0	0	0	0	2	0	0	0	0	2
Rapides	0	4	2	0	15	0	4	2	0	17
Saint Bernard	2	1	0	0	6	2	1	1	0	24
Saint Charles	0	3	2	0	10	1	11	4	0	23
Saint James	0	0	0	0	1	0	0	0	0	1
Saint John the Baptist	0	0	0	0	2	1	8	3	1	20
Saint Landry	0	0	3	0	10	0	2	5	0	12
Saint Martin	0	0	2	0	1	0	0	2	0	1
Saint Mary	1	3	0	0	18	2	8	11	2	28
Saint Tammany	1	6	6	0	29	1	6	6	0	33
Tangipahoa	0	2	1	0	7	0	3	1	0	13
Terrebonne	1	9	0	0	18	1	10	0	0	21
Vermillion	0	7	7	0	9	1	8	9	0	12
TOTAL	34	89	96	3	471	53	145	176	8	766

Map E-3: Flood Exposure of Louisiana Parish Medical Care Facilities (MCF)



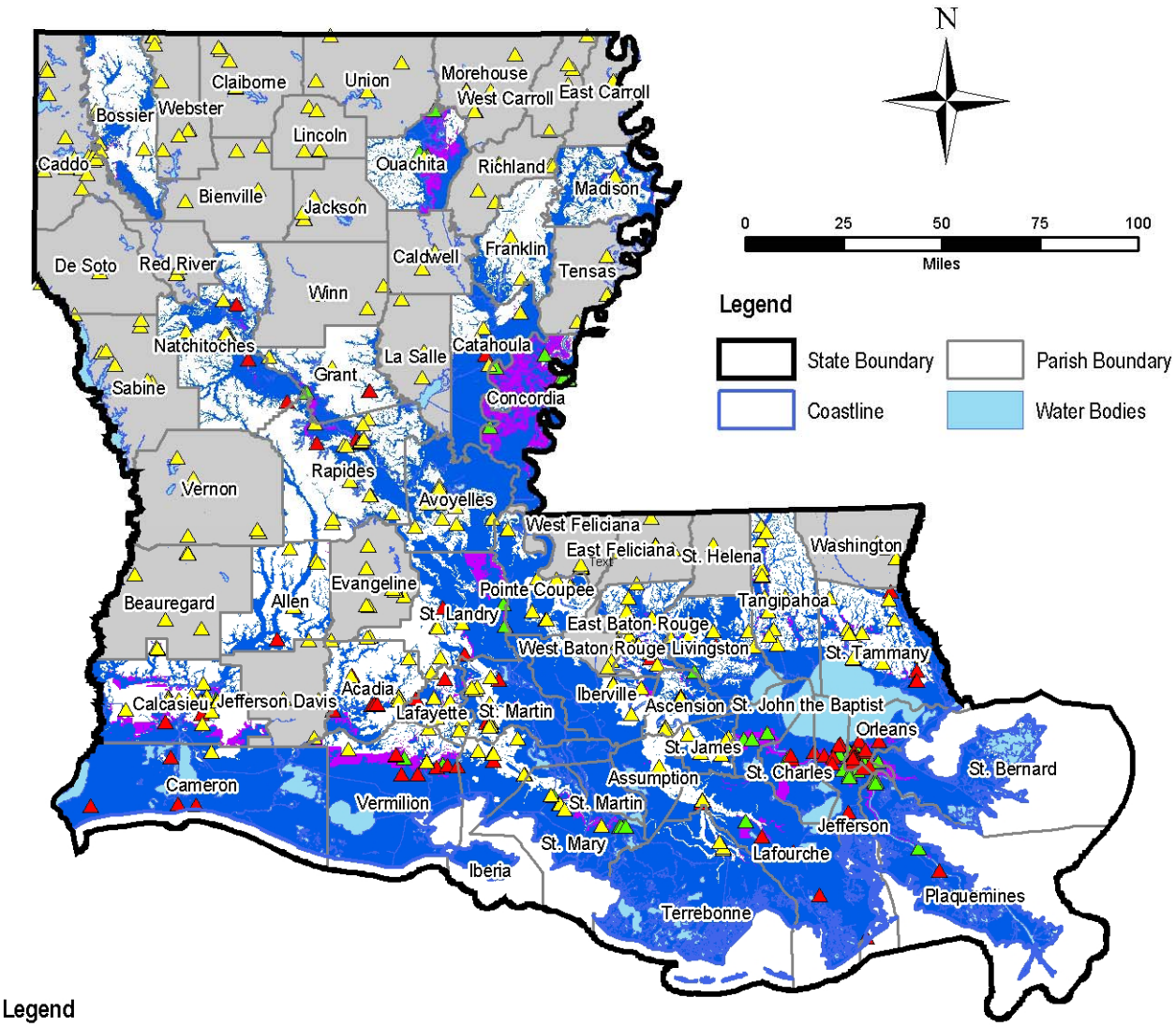
Source (Facility): HAZUS-MH

Map E-4: Flood Exposure of Louisiana Parish Fire Stations (FS)



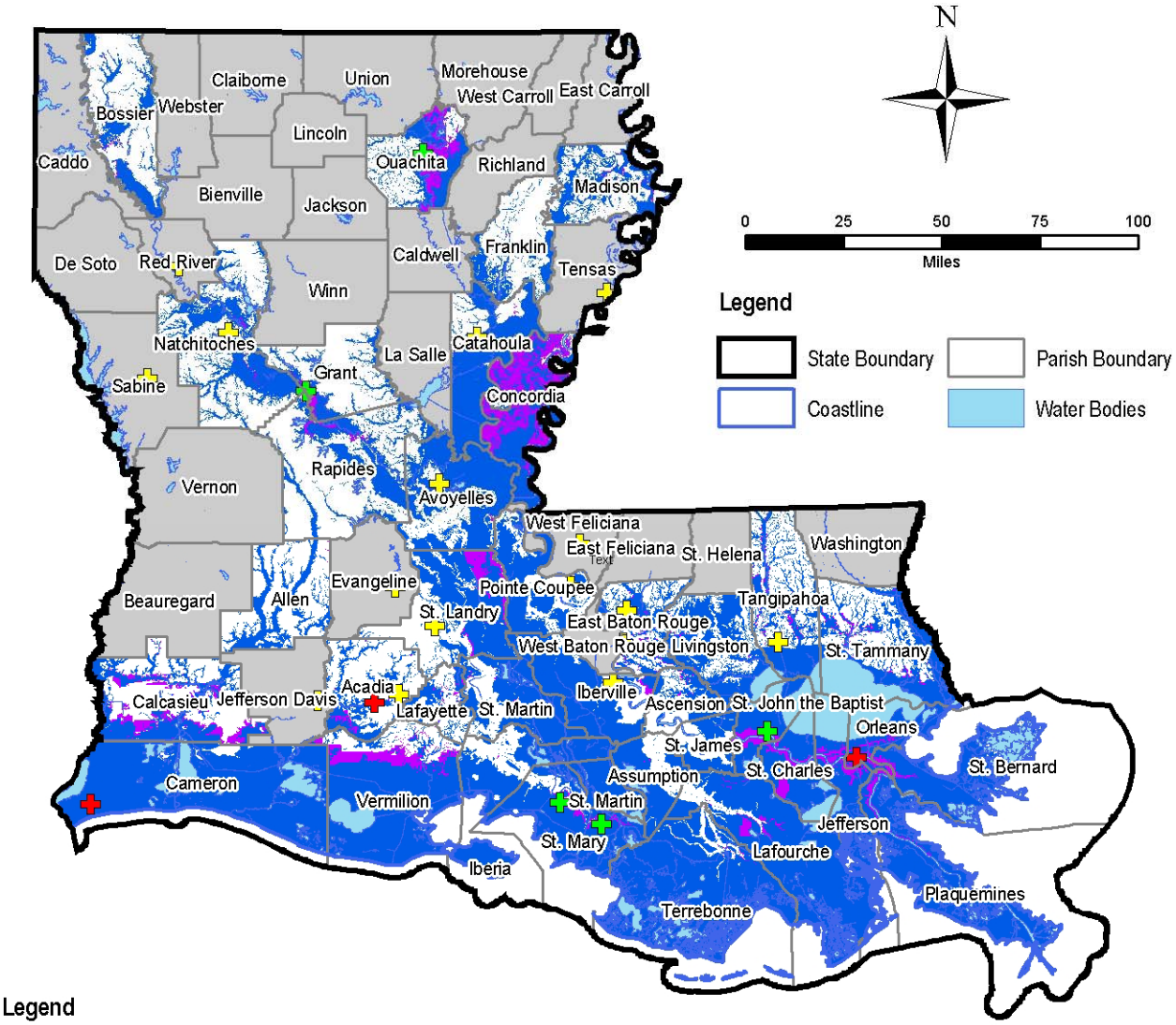
Source (Facility): HAZUS-MH

Map E-5: Flood Exposure of Louisiana Parish Police Stations (PS)



Source (Facility): HAZUS-MH

Map E-6: Flood Exposure of Louisiana Parish Emergency Response Centers (ERC)

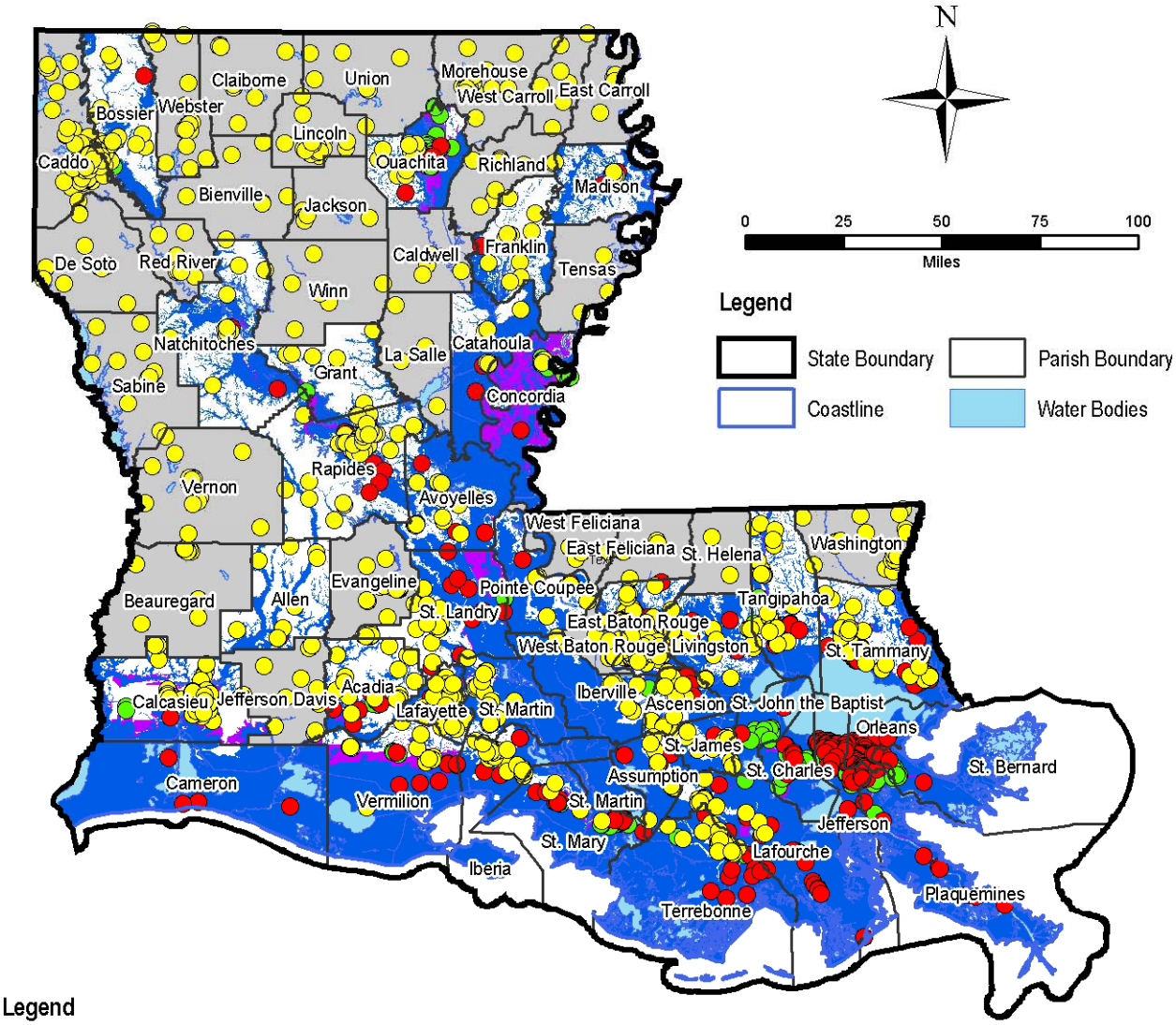


Legend

- Parishes with Unavailable Q3 Data
- 100 Year Flood Zone
- 500 Year Flood Zone
- Emergency Response Center inside 500 Year Flood Plain
- Emergency Response Center inside 100 Year Flood Plain
- Emergency Response Center outside Flood Plain

Source (Facility): HAZUS-MH

Map E-7: Flood Exposure of Louisiana Parish Schools



Source (Facility): HAZUS-MH

Data Limitations

Flood depth data is needed to calculate more accurate exposure and loss estimates.

Methodology - Transportation and Utility Systems

The HAZUS-MH infrastructure data includes the number of transportation systems, (highway bridges, railway bridges, airports and port facilities) and utility systems (water treatment plants (WTP), wastewater treatment plants (WWTP), oil facilities and natural gas facilities) per parish. The highway bridges database was developed with data from the TIGER/Line files, produced by the U.S. Census Bureau 2000. The railway bridges database was developed with data from the National Rail Network database, obtained from the Bureau of Transportation Statistics (U.S. Department of Transportation). The airports database was developed from data obtained from the Bureau of Transportation Statistics (U.S. Department of Transportation), Federal Aviation Administration. Heliports were not included. The port facilities database was developed from the Port and Waterway Facilities dataset obtained from the USACE/CEIWR, Navigation Data Center, Ports and Waterways Division. The water treatment plants (potable water facilities), wastewater treatment plants, oil facilities and natural gas facilities databases were developed with data obtained through the EPA Envirofacts Data Warehouse (Location Reference Tables (LRT) tool.

The analysis for transportation and utility system exposure used HAZUS-MH infrastructure data and Q3 flood data. Data points and lines representing the transportation and utility systems were overlaid with Q3 data to determine exposure by providing a count of the units of measurement or the number of facilities per parish located in the 100- and 500-year floodplains.

Results

Transportation and utility system exposure to the 100-year and 500-year flood event for each of the parishes with Q3 data are presented in Tables E-17 and E-18, respectively.

Table E-17. 100-Year Flood Exposure for Transportation and Utility Systems in Louisiana Parishes

Parish	100-Year Exposure (Number of Facilities)							
	Transportation Systems				Utility Systems			
	Highway Bridges	Railway Bridges	Airports	Port Facilities	WTP	WWTP	Oil Facilities	Natural Gas Facilities
Acadia	152	0	0	0	0	5	2	0
Allen	91	0	0	0	0	2	0	4
Ascension	128	0	1	27	0	4	1	2
Assumption	28	0	0	0	0	2	0	0
Avoyelles	84	0	1	0	0	0	0	1
Bossier	130	0	2	0	0	5	0	5
Calcasieu	158	0	3	68	0	2	3	3
Cameron	49	0	0	84	0	4	4	22
Catahoula	39	0	0	2	0	1	0	0
Concordia	26	0	0	3	0	2	0	0
East Baton Rouge	250	2	3	22	0	4	0	1
Franklin	43	0	2	0	0	3	0	1
Grant	83	0	1	0	0	1	0	1
Iberia	68	0	2	0	0	2	1	4
Iberville	46	0	0	14	0	1	1	5
Jefferson	205	0	0	114	1	7	4	6

Table E-17 (continued)

Parish	100-Year Exposure (Number of Facilities)							
	Transportation Systems				Utility Systems			
	Highway Bridges	Railway Bridges	Airports	Port Facilities	WTP	WWTP	Oil Facilities	Natural Gas Facilities
Lafayette	144	0	1	0	1	24	1	2
Lafourche	82	0	2	0	2	6	1	9
Livingston	172	0	1	0	0	5	0	3
Madison	54	0	1	4	0	0	1	0
Nachitoches	189	0	0	0	0	3	0	3
Orleans	241	2	1	110	0	4	0	1
Ouachita	132	0	1	2	0	9	0	7
Plaquemines	31	0	3	142	1	3	1	12
Pointe Coupe	42	1	0	2	0	2	0	2
Rapides	252	0	0	0	0	7	0	4
Saint Bernard	17	0	0	24	0	3	0	0
Saint Charles	55	0	0	41	0	7	3	3
Saint James	14	0	0	46	0	0	0	1
Saint John the Baptist	38	0	1	25	0	5	1	1
Saint Landry	164	0	2	0	0	6	1	6
Saint Martin	73	0	1	0	0	3	0	4
Saint Mary	119	0	0	0	0	9	1	14
Saint Tammany	197	0	1	4	0	12	0	0
Tangipahoa	247	0	0	2	0	6	0	0
Terrebonne	95	0	1	0	0	4	1	17
Vermillion	188	0	7	0	1	6	1	15
TOTAL	4126	5	38	736	6	169	28	159

Table E-18. 500-Year Flood Exposure for Transportation and Utility Systems in Louisiana Parishes

Parish	500-Year Exposure (Number of Facilities)							
	Transportation Systems				Utility Systems			
	Highway Bridges	Railway Bridges	Airports	Port Facilities	WTP	WWTP	Oil Facilities	Natural Gas Facilities
Acadia	155	0	0	0	0	5	2	0
Allen	91	0	0	0	0	2	0	4
Ascension	138	0	1	27	0	4	1	2
Assumption	29	0	0	0	0	2	0	0
Avoyelles	84	0	1	0	0	0	0	1
Bossier	139	0	2	0	0	5	0	5
Calcasieu	204	1	4	68	0	4	5	4
Cameron	49	0	0	84	0	4	4	22

Table E-18 (continued)

Parish	500-Year Exposure (Number of Facilities)							
	Transportation Systems				Utility Systems			
	Highway Bridges	Railway Bridges	Airports	Port Facilities	WTP	WWTP	Oil Facilities	Natural Gas Facilities
Catahoula	40	0	0	2	0	1	0	0
Concordia	42	0	5	3	1	2	0	0
East Baton Rouge	275	2	4	22	0	4	0	1
Franklin	43	0	2	0	0	3	0	1
Grant	87	0	1	0	0	1	0	1
Iberia	68	0	2	0	0	2	1	4
Iberville	48	0	0	14	0	3	1	5
Jefferson	305	1	1	121	2	12	4	6
Lafayette	164	0	1	0	1	26	1	2
Lafourche	99	0	2	0	2	6	1	9
Livingston	173	0	1	0	0	5	1	4
Madison	55	0	2	4	0	0	1	0
Nachitoches	192	0	0	0	0	3	0	3
Orleans	343	3	1	112	1	6	0	1
Ouachita	244	1	4	3	1	18	0	11
Plaquemines	34	0	4	143	1	4	2	13
Pointe Coupe	42	1	0	2	0	2	0	2
Rapides	272	1	0	0	0	8	0	4
Saint Bernard	25	0	0	24	0	4	2	3
Saint Charles	74	0	2	41	0	7	4	4
Saint James	14	0	0	46	0	0	0	1
Saint John the Baptist	39	0	1	26	0	8	4	1
Saint Landry	176	0	2	0	0	6	1	6
Saint Martin	74	0	1	0	1	3	0	4
Saint Mary	132	0	1	0	0	12	1	15
Saint Tammany	209	0	1	4	0	15	0	0
Tangipahoa	262	0	0	2	0	6	0	0
Terrebonne	95	0	1	0	0	4	1	18
Vermillion	240	0	8	0	1	6	2	15
TOTAL	4,755	10	55	748	11	203	39	172

Data Limitations

Flood depth data is needed to calculate more accurate exposure and loss estimates.